REMARKS

Reconsideration and allowance of the above referenced application is requested.

Upon entry of this amendment, claims 7-30 and 37-44 will remain in the application.

The indication that claims 25-30 and 43-44 are allowed is appreciatively noted.

Section 103 rejections

Pending claims 7-24 and 37-42 were rejected under 35 USC 103(a) as being allegedly obvious over Imahashi et al. (US 5,413,958) in view of Celler et al. (US 4,406,709).

Applicants teach irradiating a semiconductor film on a substrate with a linear laser beam while flattening the substrate against the surface of a stage with a vacuum. A linear laser beam may be selected for irradiating a substrate when uniform crystallization of the irradiated (scan) surface is desired. During the scan, the linear laser beam irradiates the entire surface of the semiconductor film. If the substrate is warped, the focal point of the linear laser beam may shift. The shift in the focal point may result in shifts in power delivered to the surface, which may in turn result in varied crystallization of the irradiated surface, as described at page 4, lines 22-31 of the Specification.

Imahashi et al. disclose irradiating portions a substrate surface with a linear laser beam (column 5, lines 24-32, Figure 4B). Furthermore, Imahashi et al. do not teach flattening the substrate during the irradiation operation.

Celler et al. disclose irradiating a substrate with a laser beam focused to a spot, not a line (column 7, line 5 and Figures 3-7). Celler et al. disclose scanning the spot in different patterns, none of which fully irradiates the scan surface.

Furthermore, Celler et al. recommend varying the power of the spot laser over the scan, e.g., at the scan edges, to avoid damaging the substrate surface (column 4, lines 5-7).

Neither Imahashi et al. nor Celler et al. contemplate the problem of irradiating the entire surface of a semiconductor film on a substrate while maintaining a consistent power level.

Consider independent claims 7, 10, 13, 16, 19, and 22, as amended, which recite in relevant part:

". . . irradiating said semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage." (emphasis added)

Neither Imahashi et al. nor Celler et al., either alone or in combination, teach or suggest irradiating the entire surface of a semiconductor film on a substrate with a linear laser beam while flattening the substrate against a stage. Accordingly, Applicants submit that independent claims 7, 10, 13, 16, 19, and 22, as amended, and their dependencies, are allowable.

Applicant submits that all of the claims are now in condition for allowance, which action is requested. Filed herewith is a check in payment of the Petition for Automatic Extension. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 2/28/01

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Yamazaki, et al. Art Unit : 1765
Serial No.: 09/304,523 Examiner : D. Champagne
Filed : May 4, 1999
Title : METHOD AND APPARATUS FOR PRODUCING SEMICONDUCTOR DEVICE

BOX RCE
Commissioner for Patents
Washington, D.C. 20231

APPENDIX

7. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating said semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage.

CERTIFICATE OF MAILING BY FIRST CLASS MAIL
I hereby certify under 37 CFR §1.8(a) that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage on the date indicated below and is addressed to the Commissioner for Patents, Washington, D.C. 20231.

February 28, 2001
Date of Deposit

Nancy Grant
Signature

Nancy Grant
Typed or Printed Name of Person Signing Certificate

10. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface and at least one suction inlet in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating said semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage.

13. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

heating said substrate;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating said semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is

irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage.

16. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

heating said substrate;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface and at least one suction inlet in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating said semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage.

19. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

heating substrate to crystallize said semiconductor film;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating the crystallized semiconductor film over said substrate provided on said stage with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated.

22. (Thrice Amended) A method of manufacturing a liquid crystal display device comprising the steps of:

forming a semiconductor film over a substrate having an upper surface and a lower surface, wherein said upper surface is an insulating surface;

heating substrate to crystallize said semiconductor film;

flattening said substrate by vacuum-sucking said substrate onto a stage having a flat surface and at least one suction inlet in such a manner that said lower surface of said substrate is in contact with said flat surface of the stage; and

irradiating the crystallized semiconductor film with a laser beam having a cross section which is elongated in one direction while relatively moving said substrate with respect to said laser beam so that the entire surface of said semiconductor film is irradiated, while said lower surface of said substrate is in contact with said flat surface of the stage.